WHAT IS CLAIMED IS:

1. A six speed gear assembly for a motorcycle transmission comprising:

a mainshaft gear shaft;

a plurality of mainshaft gears mounted in sequence on the mainshaft and comprising:

a mainshaft 4th gear,

a mainshaft 3rd gear,

a gear chosen from the group consisting of a mainshaft 1st gear and a mainshaft 2nd gear,

a remaining gear from the group consisting of the mainshaft 1st gear and the mainshaft 2nd gear,

a mainshaft 6th gear, and

a mainshaft 5th gear;

a countershaft gear shaft; and

a plurality of countershaft gears mounted in sequence on the countershaft and comprising:

a countershaft 4th gear,

a countershaft 3rd gear,

a gear chosen from the group consisting of a countershaft 1st gear and a countershaft 2nd gear,

a remaining gear from the group consisting of the countershaft 1st gear and the countershaft 2nd gear,

a countershaft 6th gear, and

a countershaft 5th gear.

2. The six speed gear assembly of claim 1, wherein each mainshaft gear is axially restrained relative to the mainshaft and wherein each countershaft gear is axially restrained relative to countershaft.

3. The six speed gear assembly of claim 2, wherein each mainshaft gear meshes in 100% gear mesh engagement with a corresponding countershaft gear.

4. The six speed gear assembly of claim 1, wherein each mainshaft gear meshes with a corresponding countershaft gear to form a plurality of gear couplings, and wherein one of the gears from each gear coupling is rotatably coupled to its corresponding gear shaft and the remaining gear from each gear coupling is non-rotatably coupled to its corresponding gear shaft

5. The six speed gear assembly of claim 4, wherein each rotatably coupled gear is removably engaged by a corresponding one of a plurality of shift rings, and wherein each shift ring is non-rotatably coupled to a corresponding one of the gear shafts.

6. The six speed gear assembly of claim 4, wherein each rotatably coupled gear comprises pockets that are removably engaged by dogs that protrude from a corresponding one of a plurality of shift rings, and wherein each shift ring is non-rotatably coupled to a corresponding one of the gear shafts.

7. The six speed gear assembly of claim 5, wherein each shift ring is disposed between a corresponding pair of the rotatably coupled gears.

8. The six speed gear assembly of claim 7, wherein each shift ring is axially movable relative to its corresponding gear shaft to selectively engage a desired one of the gears in its corresponding rotatably coupled gear pair.

9. The six speed gear assembly of claim 7, wherein each shift ring is axially movable relative to its corresponding gear shaft and comprises a body having a first plurality of dogs protruding from a first side of its body to selectively engage the pockets of one of the gears in its corresponding rotatably coupled gear pair and a second plurality of dogs protruding from a second side of its body to selectively engage the pockets of the remaining gear in its corresponding rotatably coupled gear pair.

10. A six speed gear assembly for a motorcycle transmission comprising:

a mainshaft gear shaft;

a plurality of mainshaft gears mounted on the mainshaft and comprising 1st, 2nd, 3rd, 4th, 5th and mainshaft 6th gears;

a countershaft gear shaft;

a plurality of countershaft gears mounted on the countershaft and comprising 1st, 2nd, 3rd, 4th, 5th and countershaft 6th gears; and

wherein each mainshaft gear meshes with a corresponding countershaft gear to form a plurality of gear couplings;

wherein one of the gears from each gear coupling is rotatably coupled to its corresponding gear shaft and the remaining gear from each gear coupling is non-rotatably coupled to its corresponding gear shaft; and

wherein each rotatably coupled gear is removably engaged by one of a plurality of shift rings.

11. The six speed gear assembly of claim 10, wherein each shift ring is non-rotatably coupled to a corresponding one of the gear shafts.

12. The six speed gear assembly of claim 11, wherein each rotatably coupled gear comprises pockets that are removably engaged by dogs that protrude from one of the plurality of shift rings.

13. The six speed gear assembly of claim 11, wherein each shift ring is disposed between a corresponding pair of the rotatably coupled gears.

14. The six speed gear assembly of claim 13, wherein each shift ring is axially movable relative to its corresponding gear shaft to selectively engage a desired one of the gears in its corresponding rotatably coupled gear pair.

15. The six speed gear assembly of claim 13, wherein each shift ring is axially movable relative to its corresponding gear shaft and comprises a body having a first plurality of dogs protruding from a first side of its body to selectively engage the pockets of one of the gears in its corresponding rotatably coupled gear pair and a second plurality of dogs protruding from a second side of its body to selectively engage the pockets of the remaining gear in its corresponding rotatably coupled gear pair.

16. The six speed gear assembly of claim 11, wherein each mainshaft gear is axially restrained relative to the mainshaft and wherein each countershaft gear is axially restrained relative to countershaft.

17. The six speed gear assembly of claim 16, wherein each mainshaft gear meshes in 100% gear mesh engagement with a corresponding countershaft gear.

18. A method of retrofitting a six speed motorcycle transmission to a stock Harley Davidson® five speed transmission case, wherein the stock case comprises a central portion, a first side wall adjacent to a first side of the central portion, and a stock trapdoor adjacent to a second side of the central portion, wherein the central portion comprises a top surface and a central portion opening, the method comprising:

removing the stock trapdoor;

providing a six speed gear assembly comprising a mainshaft gear shaft and a countershaft gear shaft;

mounting a plurality of mainshaft gears on the mainshaft, wherein the plurality of mainshaft gears comprises mainshaft 1st, 2nd, 3rd, 4th, 5th and 6th gears;

mounting a plurality of countershaft gears on the countershaft, wherein the plurality of countershaft gears comprises countershaft 1st, 2nd, 3rd, 4th, 5th and 6th gears, wherein each mainshaft gear meshes with a corresponding countershaft gear to form a plurality of gear couplings;

securing the six speed gear assembly to a replacement trapdoor, the replacement trapdoor comprising a recess that receives at least a portion of the thickness of one of the gear couplings; and

securing the replacement trapdoor and the six speed gear assembly to the stock case.

19. The method of claim 18, wherein the six speed gear assembly is secured to the replacement trapdoor, such that the recess of the replacement trapdoor receives at least a majority of the thickness of one of the gear couplings.

20. The method of claim 18, wherein the mainshaft 4th gear meshes with the countershaft 4th gear to form one of the plurality of gear couplings and wherein the six speed gear assembly is secured to the replacement trapdoor, such that the recess of the replacement trapdoor receives at least a portion of the thickness of each of the mainshaft 4th gear and the countershaft 4th gear.

21. The method of claim 20, further comprising mounting a speedo sensor to the trapdoor in close proximity to the mainshaft 4th gear.

22. The method of claim 18, wherein the mainshaft 4th gear meshes with the countershaft 4th gear to form one of the plurality of gear couplings and wherein the six speed gear assembly is secured to the replacement trapdoor, such that the recess of the replacement trapdoor receives at least a majority of the thickness of each of the mainshaft 4th gear and the countershaft 4th gear.

23. The method of claim 18, wherein mounting the plurality of mainshaft gears on the mainshaft gear shaft comprises mounting each mainshaft gear such that each mainshaft gear is axially restrained relative to the mainshaft gear shaft and wherein mounting the plurality of countershaft gears on the countershaft gear shaft comprises mounting each

countershaft gear such that each countershaft gear is axially restrained relative to the countershaft gear shaft

24. The method of claim 18, wherein each of the plurality of gear couplings meshes in 100% gear mesh engagement.

25. The method of claim 18, wherein one of the gears from each gear coupling is rotatably coupled to its corresponding gear shaft and the remaining gear from each gear coupling is non-rotatably coupled to its corresponding gear shaft

26. The method of claim 25, wherein each rotatably coupled gear is removably engaged by a corresponding one of a plurality of shift rings, and wherein each shift ring is non-rotatably coupled to a corresponding one of the gear shafts.

27. The method of claim 25, wherein each rotatably coupled gear comprises pockets that are removably engaged by dogs that protrude from a corresponding one of a plurality of shift rings, and wherein each shift ring is non-rotatably coupled to a corresponding one of the gear shafts.

28. The method of claim 26, wherein each shift ring is disposed between a corresponding pair of the rotatably coupled gears.

29. The method of claim 28, wherein each shift ring is axially movable relative to its corresponding gear shaft to selectively engage a desired one of the gears in its corresponding rotatably coupled gear pair.

30. The method of claim 28, wherein each shift ring is axially movable relative to its corresponding gear shaft and comprises a body having a first plurality of dogs protruding from a first side of its body to selectively engage the pockets of one of the gears in its corresponding rotatably coupled gear pair and a second plurality of dogs protruding from a second side of its body to selectively engage the pockets of the remaining gear in its corresponding rotatably coupled gear pair.

31. The method of claim 18, further comprising:

mounting a 3-4 shift ring on a corresponding one of the gear shafts and disposing the 3-4 shift ring between one of the gear couplings chosen from the group consisting of the 4th and mainshaft 3rd gears and the 4th and countershaft 3rd gears, such that that the 3-4 shift ring selectively engages a desired one of the gear couplings chosen from the group consisting of the 4th and mainshaft 3rd gears and the 4th and countershaft 3rd gears; and

providing a 3-4 shift fork comprising a fork arm that engages a groove in the 3-4 shift ring to axially move the 3-4 shift ring relative to its corresponding gear shaft, wherein the 3-4 shift fork comprises an arm connected to the fork arm and extending across at least two gears of a corresponding gear shaft.

32. The method of claim 18, further comprising:

mounting a shift ring on a corresponding one of the gear shafts and disposing the shift ring between two of the gear couplings such that the shift ring is selectively engagable to a desired one of the two gear couplings; and

mounting a shift fork on the shift ring such that a fork arm engages a groove in the shift ring to axially move the shift ring relative to its corresponding gear shaft, wherein the shift fork comprises an arm connected to the fork arm that extends across at least two gears of a corresponding gear shaft.

33. The method of claim 18, further comprising:

mounting a shifting assembly to the top surface of the central portion of the transmission case;

mounting a shift ring to the shifting assembly, wherein the shift ring comprising a fork arm, and an elongated arm extending generally perpendicularly from the fork arm, wherein when the fork arm is disposed in close proximity to the replacement trapdoor, the elongated arm extends over at least two gears of a corresponding gear shaft, while a pin extends from the fork arm, through the central portion opening and into engagement with a recessed groove in a shift drum of the shifting assembly.

34. The method of claim 18, further comprising:

providing a replacement end cover having a recess;

forming a protrusion that extends from a portion of the replacement trapdoor;

inserting the protrusion of the replacement trapdoor into the recess of the cover such that a rotation movement of the replacement end cover relative to the replacement trapdoor is prevented.

35. The method of claim 18, further comprising:

mounting the plurality of mainshaft gears on the mainshaft gear shaft in a sequence that comprises:

the mainshaft 4th gear,

the mainshaft 3rd gear,

a gear chosen from the group consisting of the mainshaft 1st gear and the mainshaft 2nd gear,

a remaining gear from the group consisting of the mainshaft 1st gear and the mainshaft 2nd gear,

the mainshaft 6th gear, and

the mainshaft 5th gear; and

mounting the plurality of countershaft gears on the countershaft gear shaft in a sequence that comprises:

the countershaft 4th gear;

the countershaft 3rd gear;

a gear chosen from the group consisting of the countershaft 1st gear and the countershaft 2nd gear;

a remaining gear from the group consisting of the countershaft 1st gear and the countershaft 2nd gear;

the countershaft 6th gear; and

the countershaft 5th gear.

36. The method of claim 18, wherein the stock case further comprises a shift fork shaft mounting flange for mountingly receiving a shift fork shaft of a shifting assembly, the method further comprising removing the shift fork shaft mounting flange.

37. The method of claim 36, further comprising:

forming a shift fork shaft opening in the replacement trapdoor;

providing a shift fork shaft; and

mounting an end of a shift fork shaft in the shift fork shaft opening of the replacement trapdoor.

38. The method of claim 18, wherein the stock case further comprises a shift pawl, the method further comprising:

removing the shift pawl;

mounting a replacement shift pawl to a shifting assembly that comprises a shift drum having a plurality of shift pins, such that movements of the shift pins causes up shifting and downshifting of the gears, wherein the shift pawl comprises a ratchet arm connected to at least one of the shift pins for causing the up-shifting and a down-shifting of the gears, and wherein the shift pawl further comprises a second arm that prevents the ratchet arm from down shifting by more than one gear.

39. The method of claim 38, wherein the second arm is an over-downshift protection arm.

40. The method of claim 18, wherein the six speed motorcycle transmission is retrofitted to the stock Harley Davidson® five speed transmission case without modifying an overall length of the stock Harley Davidson® five speed transmission case.

41. A trapdoor for retrofitting to a stock Harley Davidson® five speed transmission case, the trapdoor comprising:

a trapdoor base; and

a recess in the trapdoor base for receiving at least a portion of the thickness of a gear from a six speed gear assembly.

42. The trapdoor of claim 41, wherein said gear from the six speed gear assembly that is received by the recess of the trapdoor is a mainshaft 4th gear.

43. The trapdoor of claim 41, wherein said gear from the six speed gear assembly that is received by the recess of the trapdoor has a size and shape substantially similar to a stock Harley Davidson® mainshaft 4th gear.

44. The trapdoor of claim 41, wherein the recess of the trapdoor comprises a length sufficient for receiving the length of a meshed gear coupling from the six speed gear assembly.

45. The trapdoor of claim 44, wherein said meshed gear coupling from the six speed gear assembly that is received by the length of the recess of the trapdoor is a meshed gear coupling of a mainshaft 4th gear and a countershaft 4th gear.

46. The trapdoor of claim 44, wherein said meshed gear coupling from the six speed gear assembly that is received by the length of the recess of the trapdoor is a meshed coupling of a gear having a size and shape substantially similar to a stock Harley Davidson® mainshaft 4th gear and a gear having a size and shape substantially similar to a stock Harley Davidson® countershaft 4th gear.

47. The trapdoor of claim 41, further comprising a protrusion extending from the trapdoor base for engagement with a recess in an end cover, such that when the protrusion of the trapdoor is inserted into the recess of the end cover,

a rotational movement of the trapdoor relative to the end cover is prevented.

48. A trapdoor for a motorcycle transmission comprising:

a trapdoor base; and

a recess in the trapdoor base for receiving at least a portion of the thickness of a gear from a transmission gear assembly.

49. The trapdoor of claim 48, wherein said gear from the transmission gear assembly that is received by the recess of the trapdoor is a mainshaft 4th gear.

50. The trapdoor of claim 48, wherein said gear from the transmission gear assembly that is received by the recess of the trapdoor has a size and shape substantially similar to a stock Harley Davidson® mainshaft 4th gear.

51. The trapdoor of claim 48, wherein the recess of the trapdoor comprises a length sufficient for receiving the length of a meshed gear coupling from the transmission gear assembly.

52. The trapdoor of claim 51, wherein said meshed gear coupling from the transmission gear assembly that is received by the length of the recess of the trapdoor is a meshed coupling of a mainshaft 4th gear and a countershaft 4th gear.

53. The trapdoor of claim 51, wherein said meshed gear coupling from the transmission gear assembly that is received by the length of the recess of the trapdoor is a meshed coupling of a gear having a size and shape substantially similar to a stock Harley Davidson® mainshaft 4th gear and a

gear having a size and shape substantially similar to a stock Harley Davidson® countershaft 4th gear.

54. The trapdoor of claim 48, further comprising a protrusion extending from the trapdoor base for engagement with a recess in an end cover, such that when the protrusion of the trapdoor is inserted into the recess of the end cover, a rotational movement of the trapdoor relative to the end cover is prevented.

55. A trapdoor and end cover combination for a motorcycle transmission comprising:

a trapdoor base having a protrusion extending therefrom; and

an end cover base having a recess formed therein, wherein the protrusion of the trapdoor mates with the recess in the end cover to prevent a rotational movement of the trapdoor relative to the end cover.

56. A transmission assembly comprising:

a six speed gear assembly comprising a mainshaft gear shaft and a countershaft gear shaft;

a plurality of mainshaft gears mounted on the mainshaft, wherein the plurality of mainshaft gears comprises mainshaft 1st, 2nd, 3rd, 4th, 5th and 6th gears;

a plurality of countershaft gears mounted on the countershaft, wherein the plurality of countershaft gears comprises countershaft 1st, 2nd, 3rd, 4th, 5th and 6th gears, and wherein a mainshaft gear meshes with a corresponding countershaft gear to form a gear coupling; and

a trapdoor comprising a recess that receives at least a portion of the thickness of one of the gears.

57. The transmission assembly of claim 56, wherein the recess receives at least a majority of the thickness of one of the gears.

58. The transmission assembly of claim 56, wherein the mainshaft 4th gear meshes with the countershaft 4th gear to form said gear coupling and wherein the recess of the trapdoor receives at least a portion of the thickness of the mainshaft 4th gear.

59. The transmission assembly of claim 58, further comprising a speedo sensor mounted within the recess of the trapdoor and in close proximity to the mainshaft 4th gear.

60. The transmission assembly of claim 56, wherein the mainshaft 4th gear meshes with the countershaft 4th gear to form said gear coupling and wherein the recess of the trapdoor receives at least a majority of the thickness of the mainshaft 4th gear.